

Ultra-Low-Power High-Frequency Micro-Vortex Generators for Transonic Flow Control, Phase I

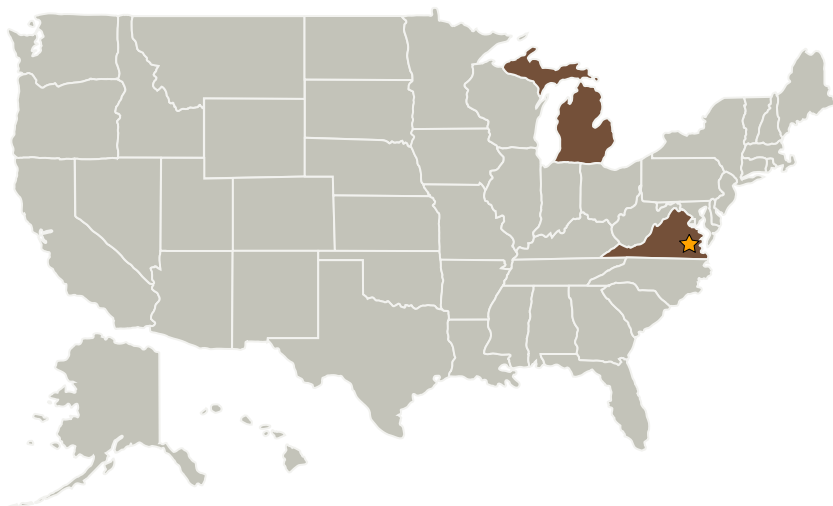
Completed Technology Project (2007 - 2007)



Project Introduction

Active flow control to prevent or delay boundary layer separation dramatically improves the performance of air vehicles in critical regions of the flight envelope. FlexSys Inc. has designed a compact, efficient, electromechanical High-Frequency Micro-Vortex Generator system (HiMVG) and tested it at subsonic speeds, proving that, when tuned to the boundary layer, it is as effective at promoting flow attachment as that of the best oscillatory pneumatic systems but is light-weight and energy-efficient, consuming a maximum 6 watts of power per actuator. We propose to enhance the HiMVG system by further reducing its power consumption, increasing its maximum oscillating frequency, and demonstrating its effectiveness at transonic speeds. The proposed system will have a tunable natural frequency, so that as the flow velocity changes, we can adjust the HiMVG system's natural frequency to match the optimal vortex generator frequency, allowing us to maintain nearly constant, ultra-low-power consumption. This will allow effective flow control for diverse flight conditions. The system will consume very little power - less than one watt per actuator - allowing large arrays to operate using light-weight, compact power supplies. These improvements will make the HiMVG system feasible for a wide variety of situations where active flow control is necessary, from subsonic through transonic conditions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
FlexSys, Inc.	Supporting Organization	Industry	Ann Arbor, Michigan

Primary U.S. Work Locations	
Michigan	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.5 Propulsion Flowpath and Interactions